A comparison of techniques for sampling amphibians in isolated wetlands in Georgia, USA

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Abstract

We compared the effectiveness of five amphibian sampling methods in nine isolated wetlands in Baker County, Georgia, USA. Overall, aquatic funnel traps yielded the most species, although the number detected using frogloggers (automated frog call recording devices), funnel traps, dipnetting, and PVC pipe refugia was not significantly different among sampling techniques. We detected the same median number of species with funnel traps and frogloggers as with all five methods combined. Methods varied widely in their detection probabilities for individual species and life stages. Species occupancy estimates were strongly affected by method choice. Our results suggest that a combination of methods and prolonged sampling periods are necessary to detect the large number of species present in southeastern isolated wetlands. We recommend that future amphibian surveys in these habitats use a combination of floating funnel traps, frogloggers, and crayfish traps as sampling methods when an assessment of species richness is the objective of a study.

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Key words

Amphibian, detection, Georgia, isolated wetland, method, monitoring, occupancy modeling, United States.

Introduction

Recent concerns about worldwide amphibian population declines have highlighted the need for gathering baseline and long-term information. Little is known about the current or historical status of amphibian populations in the southeastern United States (Dodd, 1997; LaClaire, 1997), although extensive habitat loss has occurred in this region in the past century (Hefner and Brown, 1985; Noss, 1989). Baseline information on amphibians in the region is needed to assist future monitoring and conservation efforts (LaClaire, 1997).
A wide variety of survey methods are available for sampling amphibians in aquatic habitats (Heyer et al., 1994). However, studies have shown that these methods can vary widely in effectiveness for individual species and life stages (Buench and Egeland, 2002; Willson and Dorcas, 2003; Smith et al., 2006; Gunzburger, 2007). Few studies have assessed the effectiveness of standard sampling methods for southeastern amphibians, particularly within isolated wetlands (but see Gunzburger, 2007; Todd et al., 2007). In this paper, we evaluate the effectiveness of five amphibian survey methods for detecting different species and life stages in hydrologically isolated wetlands within the southeastern Coastal Plain and present information on two methods (PVC pipes and funnel traps) not evaluated by Gunzburger (2007).

Materials and methods

Our study was conducted on Ichauway (31°13′16.88″N and 84°28′37.81″W), an 11 800 ha private reserve located in Baker County, Georgia, USA. The site primarily consists of 70-90-year-old longleaf pine (Pinus palustris) forest interspersed with approximately 100 limesink wetlands. We intensively sampled nine 0.5-6.6 ha wetlands for amphibians from March 15-May 21, 2005 using dipnet surveys, aquatic funnel traps, crayfish traps, PVC pipe refugia, and automated frog call recorders (frogloggers).

Sampling methods

Dipnet surveys were conducted three times at each wetland using a square-frame dipnet (36 × 38 cm, 5 mm mesh). During each visit 100 1-m sweeps were distributed equally around the wetland perimeter and among all shallow (<0.5 m) microhabitats. Anuran call surveys were conducted using frogloggers (Dodd, 2003), which were placed at the wetland edge and programmed to record one minute per hour between 2000 and 0700 h for six consecutive nights. Commercial crayfish traps (2.5 cm mesh, Lee Fisher International, Tampa, Florida, USA) and double-ended funnel traps (Heyer et al., 1994) were set in wetlands for 12 consecutive nights and checked every two days. Funnel traps were modified by inserting a strip of styrofoam, which enabled traps to float partially submerged in the water. Five crayfish traps were distributed evenly around the wetland perimeter at a depth of ca. 20 cm. Funnel traps were placed every 50 m parallel to the bank at a water depth of 0.25 m. Two to 30 funnel traps were used in each wetland.

Whenever possible, amphibians were identified in the field and released; however, larvae that could not be identified in the field were raised in the laboratory to metamorphosis or euthanized with chloretone solution, preserved in 10% buffered formalin, and identified from appropriate keys (Altig, 1970; Altig et al., 1998). Larvae of Pseudacris crucifer, Pseudacris nigrita, and Pseudacris feriarum are similar in appearance and there currently are no adequate keys to distinguish among these